(12) UK Patent Application (19) GB (11) 2 355 575 (13) A

(43) Date of Printing by UK Office 25.04.2001

(21) Application No 0102129.4

(22) Date of Filing 25.05.2000

(30) Priority Data
(31) 9912312 (32) 26.05.1999 (33) GB

(86) International Application Data
PCT/GB00/02011 En 25.05.2000

(87) International Publication Data
WO00/74053 En 07.12.2000

(51) INT CL^7
G11B 20/00

(52) UK CL (Edition S)
G5R RB265 RHB

(56) Documents Cited by ISA
EP 0984346 A WO 98/52194 A JP 620111321 A
JP 110003568 A US 5596639 A US 5418852 A

(58) Field of Search by ISA
INT CL^7 G11B
Online: EPODOC; WPI; PAJ; INSPEC; IBM-TDB; COMPENDEX

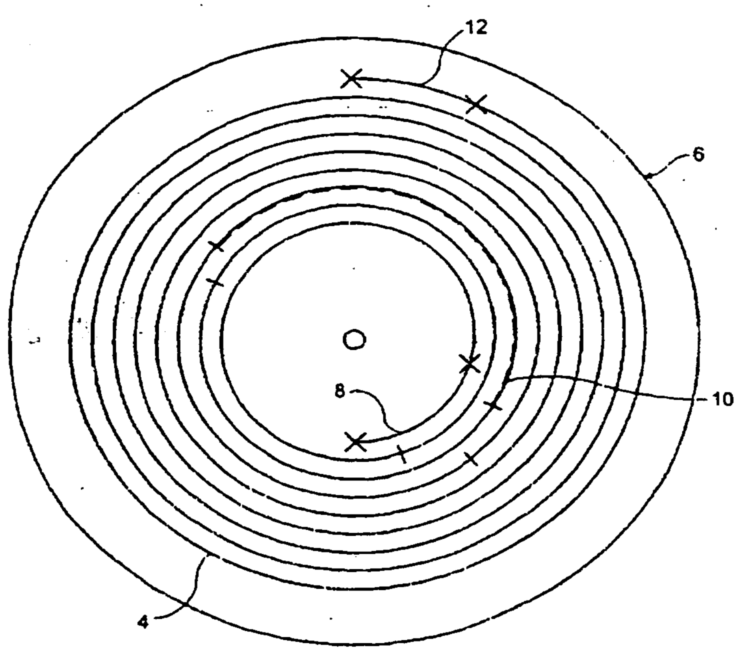
(71) Applicant(s)
Macrovision Europe Limited
(Incorporated in the United Kingdom)
Woodley House, Crockhamwell Road, Woodley, READING, Berkshire, RG5 3JP, United Kingdom

(72) Inventor(s)
Roger Edwards

(74) Agent and/or Address for Service
W H Beck, Greener & Co
7 Stone Buildings, Lincoln's Inn, LONDON, WC2A 3SZ, United Kingdom

(54) Abstract Title
The copy protection of digital audio compact discs

(57) Digital audio compact discs (CD-DA) which carry audio can be played and read by CD-ROM drives. Thus the data on the CD-DA may be read into a computer by way of its ROM drive and copied onto another disc. The increasing availability of recorders able to write to CD's poses an enormous threat to the music industry. To copy protect a digital audio compact disc (6), where control data useable by a data reader is encoded on the disc, selected control data is rendered incorrect and/or inaccurate. The incorrect data is either inaccessible to, or not generally read by, an audio player such that a legitimate audio CD which has been copy protected can be played normally on an audio player. However, the incorrect data renders the CD unplayable by a data reader.



BEST AVAILABLE COPY

GB 2 355 575 A

This print reflects a change of applicant effected after publication by WIPO but prior to entry into the national phase

THIS PAGE BLANK (USPTO)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
7 December 2000 (07.12.2000)

PCT

(10) International Publication Number
WO 00/74053 A1

(51) International Patent Classification[7]: G11B 20/00

(21) International Application Number: PCT/GB00/02011

(22) International Filing Date: 25 May 2000 (25.05.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9912312.7 26 May 1999 (26.05.1999) GB

(71) Applicant (*for all designated States except US*): **Ç-DILLA LIMITED** [GB/GB]; Woodley House, Crockhamwell Road, Woodley, Reading, Berkshire RG5 3JP (GB).

(72) Inventor; and
(75) Inventor/Applicant (*for US only*): **EDWARDS, Roger** [GB/GB]; Woodley House, Crockhamwell Road, Woodley, Reading, Berkshire RG5 3JP (GB).

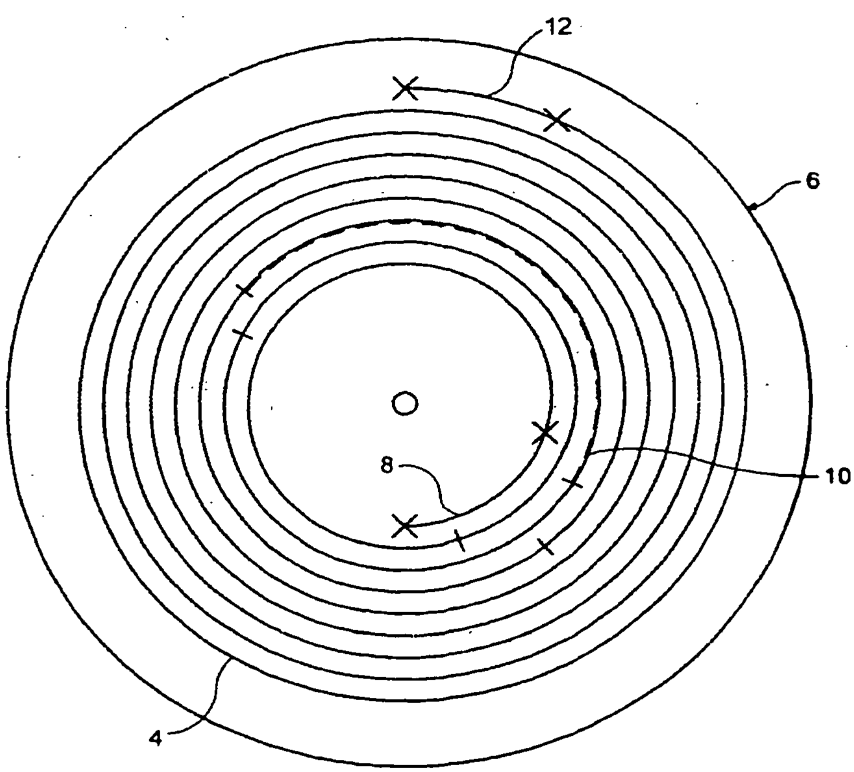
(74) Agent: **NEEDLE, Jacqueline**; W.H. Beck, Greener & Co., 7 Stone Buildings, Lincoln's Inn, London WC2A 3SZ (GB).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

[Continued on next page]

(54) Title: THE COPY PROTECTION OF DIGITAL AUDIO COMPACT DISCS



(57) Abstract: Digital audio compact discs (CD-DA) which carry audio can be played and read by CD-ROM drives. Thus the data on the CD-DA may be read into a computer by way of its ROM drive and copied onto another disc. The increasing availability of recorders able to write to CD's poses an enormous threat to the music industry. To copy protect a digital audio compact disc (6), where control data useable by a data reader is encoded on the disc, selected control data is rendered incorrect and/or inaccurate. The incorrect data is either inaccessible to, or not generally read by, an audio player such that a legitimate audio CD which has been copy protected can be played normally on an audio player. However, the incorrect data renders the CD unplayable by a data reader.

WO 00/74053 A1

IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

THE COPY PROTECTION OF DIGITAL AUDIO COMPACT DISCS

The present invention relates to a method of copy protecting a digital audio compact disc, and to a copy protected digital audio compact disc.

Digital audio compact discs (CD-DA) which carry music or other audio can be played or read by more sophisticated apparatus, such as CD-ROM drives. This means, for example, that the data on a CD-DA acquired by a user may be read into a PC by way of its ROM drive and thus copied onto another disc or other recording medium. The increasing availability of recorders able to write to CDs is therefore an enormous threat to the music industry.

The present invention seeks to provide a method of copy protecting a digital audio compact disc.

According to a first aspect of the present invention there is provided a method of copy protecting a digital audio compact disc, wherein control data usable by a data reader is encoded on the compact disc, the copy protection method comprising the step of rendering selected control data incorrect and/or inaccurate.

With an embodiment of the invention, the incorrect data encoded onto the CD is either inaccessible to, or not generally read by, an audio player. Therefore, a legitimate audio CD bought by a user can be played normally on an audio player. However, the incorrect data renders the CD unplayable by a data reader. This prevents copying of the data on the compact disc.

Of course, by rendering the audio compact disc unplayable on a data reader, the user is also prevented from using a CD-ROM drive, for example, legitimately simply to play the music or other audio on the disc.

In this specification the term "audio player" is used to refer to players and drives arranged to play the audio data on a digital audio compact disc. Such players will generally be commercially available CD music players which function solely to play the music or other audio on the CD. It is required that the incorrect

data encoded onto the CD does not generally impinge on, or affect the normal operation of, such an "audio player".

In this specification, the term "data reader" is used to refer to all players and drives which are able to read the data on the disc, for example, by extracting or otherwise accessing the data on the disc. Such players will include, therefore, CD-ROM drives. Generally, and as acknowledged above, a CD-ROM drive, for example, will not only be prevented from making a usable copy of a legitimate CD-DA, but will generally be prevented from playing a legitimate CD-DA.

In one embodiment of a method of the invention, the data encoded on the compact disc which has been rendered incorrect is navigation and/or timing data.

For example, data identifying the position on the disc of the Lead-Out is rendered incorrect in the Lead-In of the disc. Thus, data in the Lead-In which indicates the Atime at the start of the Lead-Out may be rendered incorrect. For example, the data in the Lead-In may show the Atime at the start of the Lead-Out to be zero. Alternatively, the data in the Lead-In may have a value for the Atime at the start of the Lead-Out which occurs during a first audio track on the compact disc.

Additionally and/or alternatively, the data on the CD defining the nature of the tracks is rendered incorrect.

In a preferred embodiment, the data on the CD identifying the nature of the tracks incorrectly identifies each audio track as a data track.

In a preferred embodiment of a method of the invention, the data encoded on the disc which is rendered incorrect is data in the Table of Contents (TOC) of the compact disc.

Preferably, the control data encoded on the compact disc is altered, to render it incorrect, prior to mastering of the disc.

The present invention also extends to a copy protected digital audio compact disc, wherein control data usable by a data reader is encoded on the compact disc, and wherein selected control data has been rendered incorrect and/or inaccurate.

Preferably, the incorrect data encoded onto the compact disc is either inaccessible to, or not generally read by, an audio player. This enables the copy protected disc to be played normally on an audio player. However, the data encoded on a copy protected compact disc renders the disc generally unplayable by a data reader. This prevents the use of a data reader to extract or read the data on the disc, whereby copying of the disc is also prevented. Of course, it is no longer possible to use a CD-ROM drive, for example, to play the audio on a legitimately acquired copy protected disc,

In an embodiment, the incorrect control data on the copy protected disc is navigation and/or timing data.

For example, incorrect control data is provided in the Lead-In, and identifies the position on the disc of the Lead-Out. Thus, the incorrect control data in the Lead-In may indicate incorrectly the Atime at the start of the Lead-Out. For example, the incorrect control data in the Lead-In may show the Atime at the start of the Lead-Out to be zero.

Alternatively, the incorrect control data in the Lead-In may have a value for the Atime at the start of the Lead-Out which occurs during a first audio track on the compact disc.

Additionally and/or alternatively, a copy protected digital audio compact disc of the invention may have incorrect control data encoded onto the disc which defines the nature of the tracks on the disc.

In an embodiment, the incorrect control data incorrectly identifies each audio track as a data track.

A copy protected digital audio compact disc of the invention may have incorrect control data encoded thereon which is control data in the Table of Contents (TOC) of the disc.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows schematically a compact disc showing the spiral data track,

Figure 2 shows the structure of a frame of data encoded on a CD,

Figure 3 illustrates the general data format of the Q-subchannel,

Figure 4 shows the format of the data for the Q-subchannel according to mode,

Figure 5 shows graphically both Atime and Ttime on a compact disc,

Figure 6a shows an example of the track definition, with the Table of Contents, of a CD-DA, and

Figure 6b shows the Table of Contents of the CD-DA of Figure 6a when the disc has been copy protected.

A digital audio compact disc (CD-DA), which carries music and is to be played on an audio player such as a conventional CD disc player, is made and recorded to a standard format known as the *Red Book* standards. As well as defining physical properties of the disc, such as its dimensions, and its optical properties, such as the laser wavelength, the *Red Book* also defines the signal format and the data encoding to be used.

As is well known, the use of the *Red Book* standards ensures that any CD-DA produced to those standards will play on any audio player produced to those standards.

Figure 1 shows schematically the spiral track 4 on a CD 6. This spiral track 4 on a CD-DA is divided into a Lead-In 8, a number of successive music or audio tracks as 10, and a Lead-Out 12. The Lead-In track 8 includes a Table of Contents (TOC) which identifies for the audio player the tracks to follow, whilst the Lead-Out 12 gives notice that the track 4 is to end.

An audio player always accesses the Lead-In track 8 on start up. The music tracks may then be played consecutively as the read head follows the track 4 from Lead-In to Lead-Out. Alternatively, the player navigates the read head to the beginning of each audio track as required.

All compact disc players and readers are programmed not to move the read head beyond the start of the Lead-Out track 12. This is to protect the read head.

To the naked eye, a CD-ROM looks exactly the same as a CD-DA and has the same spiral track divided into sectors. However, data readers, such as CD-ROM drives, are much more sophisticated and are enabled to read data, and process information, from each sector of the compact disc according to the nature of that data or information. A data reader can navigate by reading information from each sector whereby the read head can be driven to access any appropriate part of the spiral track 4 as required.

To ensure that any data reader can read any CD-ROM, the compact discs and readers are also made to standards known, in this case, as the *Yellow Book* standards. These *Yellow Book* standards incorporate, but extend, the *Red Book* standards. Hence, a data reader, such as a CD-ROM drive, can be controlled to play a CD-DA.

The ability of a data reader to access, extract, or otherwise read the data on a CD-DA provides a problem for the music industry. A user can use a CD-ROM drive to read the data from an audio disc, for example, into a computer file, and then that data can be copied. The increasing availability of recorders able to record onto compact discs means that individuals and organisations now have easy access to technology for making perfect copies of audio compact discs. This is of great concern to the music industry.

An audio player, be it a dedicated compact disc music player, or a more sophisticated CD-ROM drive when controlled to play an audio disc, only looks for and uses data encoded to *Red Book* standards. What is more, if there appears to be an inaccuracy in the data, an audio player will generally continue to play rather than trying to correct the error. For example, if the read head has

navigated to the start of a track and commenced to play that track, the audio player will continue to play that track to its end, even if it becomes apparent that there is some error in the timing information, for example. By contrast, a data reader is arranged to identify and correct errors.

The present invention therefore suggests that errors should be deliberately introduced into the encoded data. For example, errors may be introduced into the *Red Book* data, but the introduced errors should be of a type which are generally transparent to an audio player. Alternatively, the audio discs may be encoded with selected and incorrect *Yellow Book* data which is not utilised by an audio player. In each case, the errors are chosen such that a data reader is unable to read or play the audio disc. It will be appreciated that a system of the invention has the disadvantage that a user cannot play a legitimately acquired audio disc having the copy protection on a data reader in a legitimate manner, that is, simply to play the music recorded on the disc. However, in view of the potential losses from piracy, the music industry is willing to accept that disadvantage.

As the data encoding on a CD-DA and on a CD-ROM is well known and in accordance with the appropriate standards, it is not necessary to describe it in detail herein.

Briefly, the data on a CD is encoded into frames by EFM (eight to fourteen modulation). Figure 2 shows the format of a frame, and as is apparent therefrom, each frame has sync data, sub-code bits providing control and display symbols, data bits and parity bits. Each frame includes 24 bytes of data, which, for a CD-DA, is audio data.

There are 8 sub-code bits contained in every frame and designated as P,Q,R,S,T,U,V and W. Generally only the P and Q sub-code bits are used in the audio format. The standard requires that 98 of the frames of Figure 2 are grouped into a sector, and the sub-code bits from the 98 frames are collected to form sub-code blocks. That is, each sub-code block is constructed a byte at a time from 98 successive frames. In this way, 8 different subchannels, P to W, are formed. These subchannels contain control data for the disc. The P- and

Q- subchannels incorporate timing and navigation data for the tracks on the disc, and generally are the only subchannels utilised on an audio disc.

The data format for a Q-subchannel block assembled from 98 successive frames is indicated in Figure 3. As is apparent, the start of the subchannel block is indicated by the appearance of sync patterns S0 and S1 as the first 2 symbols. The next data bits are control bits to define the contents of a track. Thus, the control bits might identify audio content or data content. There then follows address information, ADR, which specifies one of four modes for the Q-data bits. 72 bits of Q-data succeed the address information, and then there are 16 CRC, or check, bits which are used for error detection on the control, address and Q-data bits.

Figure 4 illustrates the data content of a Q-subchannel block in each of the four modes designated by the address information, ADR. In Mode 0, all of the Q-data has a value of zero. In Mode 0, the data of the P-subchannel is also set to zero. In Mode 2, the Q-data comprises a catalogue number for the disc, such as a bar code of the Universal Product Code. In addition, in Mode 2 the Atime count from adjacent blocks is continued. Mode 3 is used to give ISR code for identifying each music track. In addition, and as is illustrated, in Mode 3 the absolute time count, Atime, is continued.

As indicated in Figure 4, in Mode 1 the Q-data in each subchannel block contains program and time information for individual audio tracks and for the information area of the disc. As is illustrated, there is a different format for the Q-data for the Lead-In area to that within the program and Lead-Out areas. However, in both formats in Mode 1, the Q-data gives information as to the time along a track. The running time of a track is referred to as the Ttime, is in minutes, seconds and frames, and TMin, TSec and TFrame are all components of Ttime. In the program and Lead-Out areas, the Q-data additionally includes information about the absolute time, Atime, on the disc in minutes, seconds and frames, and Amin, Asec and Aframe are all components of Atime.

Figure 5 shows graphically how Atime and Ttime vary across a disc. Atime is the absolute time across the disc and starts at zero at the beginning of the program area. Ttime is the running time within each track and thus starts at

zero at the beginning of each track. Thus, and as illustrated in Figure 5, Atime increases monotonically across the disc whilst Ttime increases along each individual track. As is also illustrated in Figure 5, the P-subchannel includes flags F which each indicate the start of a respective track. The P-subchannel flags also designate the Lead-Out area.

As indicated in Figure 4, in Mode 1 each Q-subchannel block contains the next consecutive values for Atime and Ttime. When an audio player is to play an audio track, the head is navigated to the commencement of the track. The navigation may be by way of the Atime, the Ttime, and/or the P-subchannel flags, or by some combination thereof. In general, once an audio player has commenced playing a track, it will continue. Playing of the track is not generally stopped if any data errors are located, and thus the audio player effectively ignores any data errors which arise. Thus, if an audio player can be reliably navigated to the commencement of a track, it can be expected to provide a continuous audio output from that track without problem.

As set out above, in Mode 1 the Q-data provides the TOC in the Lead-In area. Part of a typical TOC is set out in table form in Figure 6a. It will be seen therefrom that each track, at 14, is given, at 16, a start address in time and in frames from the end of the Lead-In. Each track also has a logical block address (LBA) 18 which is calculated from the Atime and provides an address for the start of the track on the disc. The TOC of an audio disc also identifies the Atime from the start of the program area to the start of the Lead-Out as indicated at 20. However, the applicants have determined that generally audio players do not read or use the Lead-Out time from the TOC.

Figure 6b shows in table form part of the TOC from Figure 6a after it has been altered to copy protect the disc. Specifically, it will be seen that, at 20, the Atime from the start of the disc program area to Lead-Out has been set to zero indicating that the Lead-Out is at the commencement of the pregap of the first audio track. A data reader, therefore, accessing the disc 6 will read from the Lead-In information signifying that the disc does not have a program area and that the Lead-In is directly followed by the Lead-Out. The data reader will refuse to move the read head beyond the start of the audio track because it believes

that the first track starts within the Lead-Out. A data reader, therefore, will be unable to read or play the disc with the TOC of Figure 6b.

It will be appreciated that the values in the tables of Figures 6a and 6b are given only to illustrate how the information is manipulated to provide the copy protection. The actual values of discs in practice may differ from those shown in the tables.

The TOC of Figure 6b has been altered in a second way which also prevents proper use by a data reader of the information on the disc. In this respect, and as is apparent from Figures 6a and 6b, the tracks on the audio disc are all audio tracks as noted at 22. In the TOC of Figure 6b these tracks have been erroneously identified as data tracks. Thus, even if the data reader is manipulated to ignore the false Lead-Out information in the TOC, it is told that each of the following tracks contains digital data, rather than analog audio. Any reading of those tracks is therefore confused as the player tries to read the data but cannot find the appropriate SYNC or sector headers. Errors therefore result and the reading is unsatisfactory.

In the illustrated embodiment, the Atime has been set to zero to indicate that the Lead-Out is at the commencement of the pregap of the first audio track. It is also possible to set the Atime for the Lead-Out to an alternative, incorrect, value. Such an incorrect value will confuse a data reader and will generally prevent movement of the read head further across the disc than the position indicated by the incorrect Lead-Out time. For example, the Atime value given in the TOC for the Lead-Out might indicate a position within the first or a subsequent audio track.

Where the incorrect Atime value for the start time of the Lead-Out points to a position in the program area of the disc, a data reader may be able to access audio data on the disc at positions before that indicated by the incorrect Atime value. However, the amount of accessible audio data can be kept small. In the future, audio players may be enabled to read the Lead-Out time, for example, and in this circumstance, having the incorrect Lead-Out time identify a position within the first audio track will ensure that the audio player is able to play the copy protected disc.

The embodiments described and illustrated above identify two alterations that can be made to the data in the Lead-In to an audio disc to copy protect that disc. It will be appreciated that any data which is transparent to the audio player may be altered to prevent the operation of a data reader. Additionally and/or alternatively, data may be provided on an audio disc to prevent the generation of a digital output from the audio player. It will also be appreciated that alternative or additional errors in *Red Book* or *Yellow Book* standard data can be introduced as required.

Further modifications in or variations to the embodiments described above may be made within the scope of the appended claims of this application.

CLAIMS

1. A method of copy protecting a digital audio compact disc, wherein control data usable by a data reader is encoded on the compact disc, the copy protection method comprising the step of rendering selected control data incorrect and/or inaccurate.

2. A method as claimed in Claim 1, wherein the incorrect data encoded onto the CD is either inaccessible to, or not generally read by, an audio player.

3. A method as claimed in Claim 1 or Claim 2, wherein the incorrect data encoded onto the CD renders the disc generally unplayable by a data reader.

4. A method as claimed in any preceding claim, wherein the data encoded on the compact disc which has been rendered incorrect is navigation and/or timing data.

5. A method as claimed in Claim 4, wherein data, provided in the Lead-In, which identifies the position on the disc of the Lead-Out is rendered incorrect.

6. A method as claimed in Claim 5, wherein data in the Lead-In which indicates the Atime at the start of the Lead-Out is rendered incorrect.

7. A method as claimed in Claim 6, wherein the data in the Lead-In shows the Atime at the start of the Lead-Out to be zero.

8. A method as claimed in Claim 6, wherein the data in the Lead-In has a value for the Atime at the start of the Lead-Out which occurs during a first audio track on the compact disc.

9. A method as claimed in any preceding claim, wherein data encoded on the compact disc defining the nature of the tracks is rendered incorrect.

10. A method as claimed in Claim 9, wherein data on the CD identifying the nature of the tracks incorrectly identifies each audio track as a data track.

11. A method as claimed in any preceding claim, wherein the data encoded on the compact disc which is rendered incorrect is data in the Table of Contents (TOC) of the compact disc.

12. A method as claimed in any preceding claim, wherein the control data encoded on the compact disc is altered, to render it incorrect, prior to mastering of the disc.

13. A copy protected digital audio compact disc, wherein control data usable by a data reader is encoded on the compact disc, and wherein selected control data has been rendered incorrect and/or inaccurate.

14. A copy protected digital audio compact disc as claimed in Claim 13, wherein the incorrect data encoded onto the compact disc is either inaccessible to, or not generally read by, an audio player.

15. A copy protected digital audio compact disc as claimed in Claim 13 or Claim 14, wherein the data encoded on the compact disc renders the disc generally unplayable by a data reader.

16. A copy protected digital audio compact disc as claimed in any of Claims 13 to 15, wherein the incorrect control data on the disc is navigation and/or timing data.

17. A copy protected digital audio compact disc as claimed in Claim 16, wherein the incorrect control data is provided in the Lead-In, and identifies the position on the disc of the Lead-Out.

18. A copy protected digital audio compact disc as claimed in Claim 17, wherein the incorrect control data in the Lead-In indicates incorrectly the Atime at the start of the Lead-Out.

19. A copy protected digital audio compact disc as claimed in Claim 18, wherein the incorrect control data in the Lead-In shows the Atime at the start of the Lead-Out to be zero.

20. A copy protected digital audio compact disc as claimed in Claim 18, wherein the incorrect control data in the Lead-In has a value for the Atime at the start of the Lead-Out which occurs during a first audio track on the compact disc.

21. A copy protected digital audio compact disc as claimed in any of Claims 13 to 20, wherein the incorrect control data encoded onto the compact disc defines the nature of the tracks on the disc.

22. A copy protected digital audio compact disc as claimed in Claim 21, wherein the incorrect control data incorrectly identifies each audio track as a data track.

23. A copy protected digital audio compact disc as claimed in any of Claims 13 to 22, wherein the incorrect control data encoded onto the compact disc is control data in the Table of Contents (TOC) of the disc.

24. A method of copy protecting a digital audio compact disc substantially as hereinbefore described with reference to the accompanying drawings.

25. A copy protected digital audio compact disc substantially as hereinbefore described with reference to the accompanying drawings.

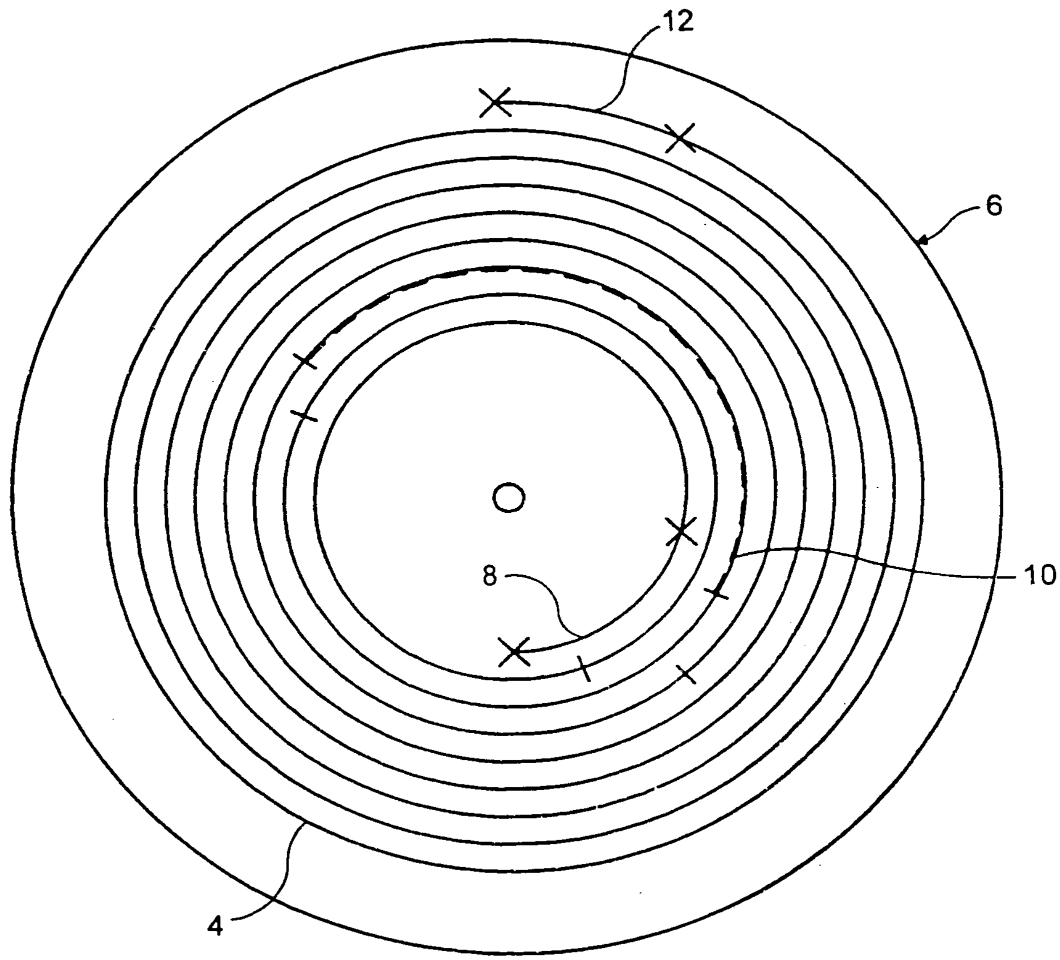


FIG. 1

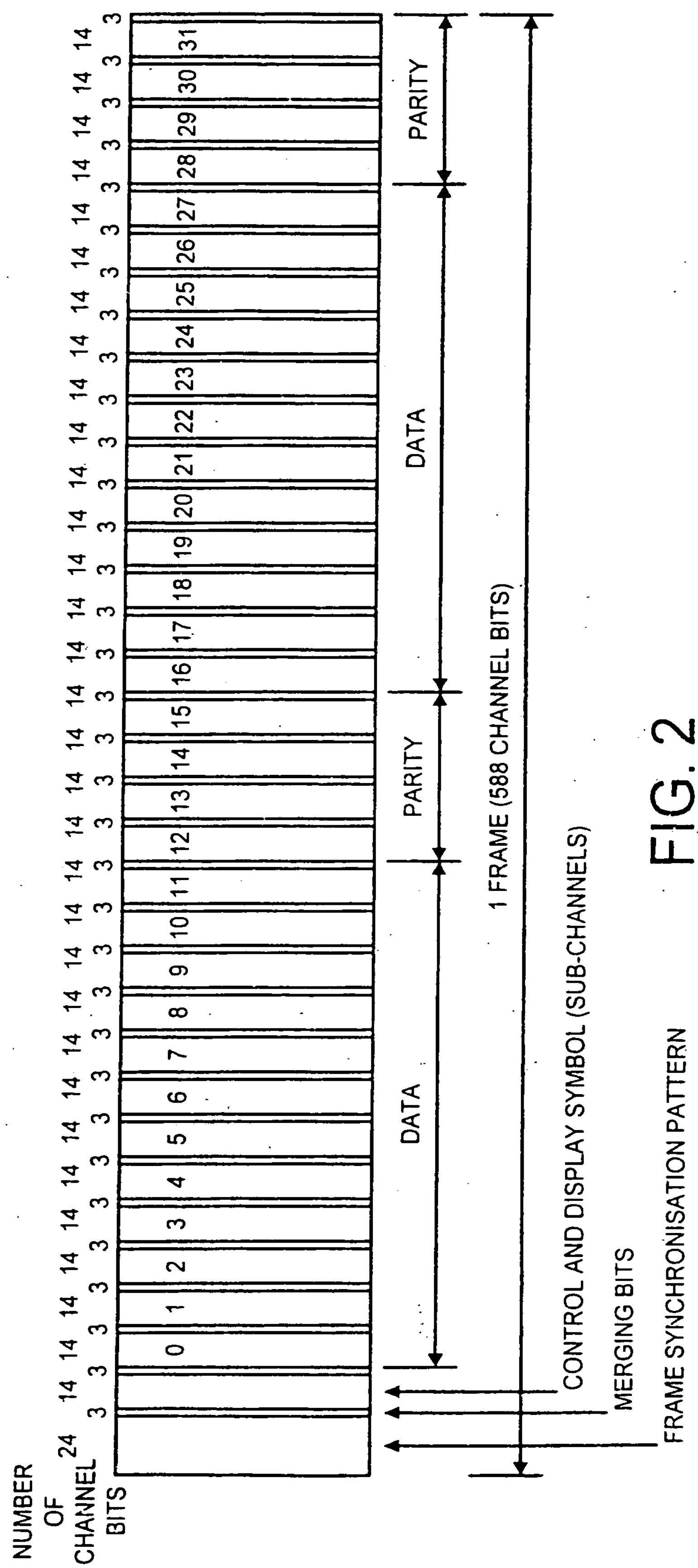
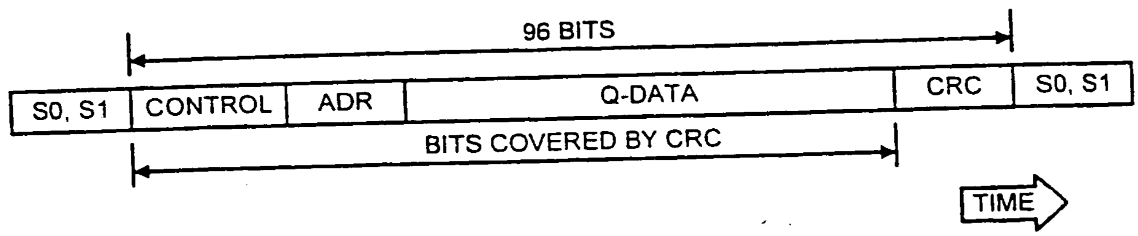

NUMBER OF CHANNEL BITS
24
3
14
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DATA
PARITY
DATA
PARITY
1 FRAME (588 CHANNEL BITS)
CONTROL AND DISPLAY SYMBOL (SUB-CHANNELS)
MERGING BITS
FRAME SYNCHRONISATION PATTERN

FIG. 2



LABEL	FUNCTION
S0, S1	SYNCHRONISATION PATTERN TO INDICATE START OF Q-SUBCHANNEL BLOCK
CONTROL	DEFINES THE KIND OF DATA IN A TRACK
ADR	SPECIFIES THE DATA MODE THAT THE Q-DATA IS IN
Q-DATA	DATA, THE FORMAT IS DEFINED BY THE VALUE OF ADR
CRC	PARITY CHECK OF "CONTROL, ADR AND Q-DATA"

FIG. 3

ADR = 0 (Mode 0)

Format Q-Data

Zero

ADR = 1 (Mode 1)

Format within the laed-in area for the Q-Data

00	Point	TMin	TSec	TFrame	Zero	Pmin	Psec	Pframe

Format within the program and leadout area for the Q-data

TNO	X	TMin	TSec	TFrame	Zero	Amin	Asec	Aframe

ADR = 2 (Mode2)

Format for Q-Data

52 bits for the catalogue number	Zero	Aframe

ADR = 3 (Mode 3)

Format for Q-Data

60 bits for ISR CODE	Zero	Aframe

FIG. 4

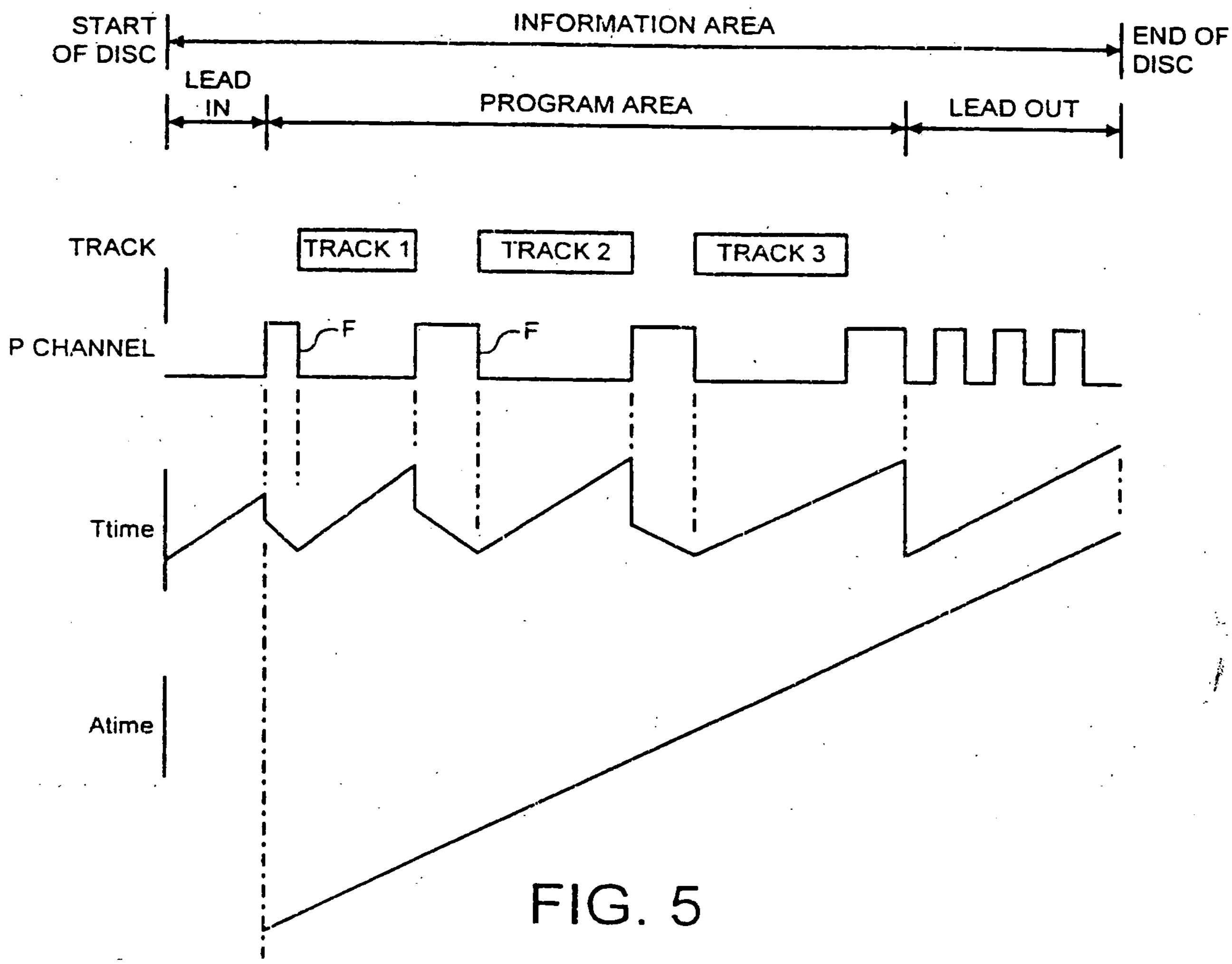


FIG. 5

14 22 16 18

Trk	Type	Min:Sec:Frm	LBA
01	AUDIO	00:02:00	000000
02	AUDIO	03:27:27	015402
03	AUDIO	07:26:57	033357
04	AUDIO	11:00:57	049407
05	AUDIO	14:52:49	066799

Leadout: 18:00:57 (LBA 82218) 20

FIG. 6a

22

Trk	Type	Min:Sec:Frm	LBA
01	DATA	00:02:00	000000
02	DATA	03:27:27	015402
03	DATA	07:26:57	033357
04	DATA	11:00:57	049407
05	DATA	14:52:49	066799

20

Leadout: 00:00:00 (LBA 4294967146)

FIG. 6b

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02011

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B20/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC, IBM-TDB, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 52194 A (IMATION CORP) 19 November 1998 (1998-11-19) abstract page 2, line 24 -page 3, line 6 page 4, line 3 - line 15 page 7, line 29 -page 9, line 29 page 11, line 11 - line 35 claims 1-3; figures 4,5 ---	1-5,9, 13-17, 21,24,25
X	US 5 596 639 A (KIKINIS DAN) 21 January 1997 (1997-01-21) column 3, line 37 - line 55 column 5, line 1 -column 6, line 24 column 7, line 18 - line 63 claim 6 ---	1,13,24, 25

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 September 2000	13/09/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Schiwy-Rausch, G

1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 00/02011

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	EP 0 984 346 A (HITACHI EUROP LTD) 8 March 2000 (2000-03-08) abstract column 1, line 44 -column 2, line 7 claims 1,2,9-11	1,13
A	US 5 418 852 A (NARUMI TOSHIKATSU ET AL) 23 May 1995 (1995-05-23) figure 28 column 16, line 11 - line 39 column 7, line 45 -column 18, line 34	1,4,12, 13,24,25
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 04, 30 April 1999 (1999-04-30) & JP 11 003568 A (VICTOR CO OF JAPAN LTD), 6 January 1999 (1999-01-06) abstract	1,2,13, 14
A	PATENT ABSTRACTS OF JAPAN vol. 011, no. 328 (P-629), 27 October 1987 (1987-10-27) & JP 62 111321 A (ONKEN:KK), 22 May 1987 (1987-05-22) abstract	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 00/02011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9852194 A	19-11-1998	AU 7472998 A	08-12-1998
US 5596639 A	21-01-1997	EP 0807346 A	19-11-1997
		JP 2994042 B	27-12-1999
		JP 10503309 T	24-03-1998
		WO 9624209 A	08-08-1996
		EP 0711479 A	15-05-1996
		WO 9503655 A	02-02-1995
		US 5563947 A	08-10-1996
EP 0984346 A	08-03-2000	JP 2000076141 A	14-03-2000
US 5418852 A	23-05-1995	JP 2575987 B	29-01-1997
		JP 5266574 A	15-10-1993
		JP 2575988 B	29-01-1997
		JP 5266575 A	15-10-1993
		JP 2575989 B	29-01-1997
		JP 5266576 A	15-10-1993
		JP 2582507 B	19-02-1997
		JP 5325418 A	10-12-1993
		DE 4308680 A	28-10-1993
		US 5982886 A	09-11-1999
JP 11003568 A	06-01-1999	NONE	
JP 62111321 A	22-05-1987	NONE	